THE Engineering Standards Committee has just issued "standard sections and specification" for tramway rails. If the series of rails be adopted, it should be easier for the British manufacturer to hold his own against foreign competition, which, in the case of tramway rails, is particularly severe.

WE have received the first parts of the monthly *Bulletin* of the Philippine Weather Bureau for 1903, prepared under the direction of the Rev. José Algué, S.J., director of the service. This bulletin, modelled on the plan of the United States meteorological publications, contains valuable climatological observations and general notes on the weather and crops. The report for 1902 contains an interesting account of the establishment and development of the service under the Spanish Government, and of its reorganisation and improvement under the United States. Meteorological observations were begun in Manila in 1865, and after many years of assiduous study of the behaviour of the typhoons of the eastern seas, Father Faura, the first director of the observatory, commenced his predictions of the approach of typhoons in July, 1879. These storm warnings have been the means of saving much life and property, not only in the Philippine Islands, but on the Chinese coasts. Their value is now fully recognised by the United States Government and by the Colonial Secretary and Chamber of Commerce of Hong Kong. On the recommendation of the chief of the U.S. Weather Bureau, a network of subsidiary stations has been established in the archipelago which will doubtless render invaluable service to our knowledge of the meteorology of the Far East.

A PAMPHLET of sixty-nine pages, extracted from the report of the expedition of the *Stella Polare* in 1899–1900, deals with the magnetic observations undertaken in the Bay of Teplitz by Captain Umberto Cagni. These observations were reduced by Prof. Luigi Palazzo, who gives the following results for July, 1899, and June, 1900:—Declination, 21° 10′ and 21° 18′ east; inclination, 83° 25′ and 83° 1·2′ north; horizontal intensity, 0·06846 and 0·06855; vertical intensity, 0·59319, 0·55990; total force, 0·59713, 0·56409. The principal instruments used were a unifilar Schneider magnetometer and a Kew inclinometer, but great difficulties were experienced in making the observations; among other inconveniences, snow was carried into the temporary observatory, and succeeded in penetrating through every crack or crevice.

SOME recent researches in the comparatively modern study of experimental phonetics are given by Prof. E. W. Scripture (Yale) in the *Medical Record* (February 28), and *Die neuern Sprachen* (January). In the former paper, Prof. Scripture describes the different methods that have been employed for registering the sound curves of the human voice. The method preferred by the author is to obtain a gramophone or phonograph record of the voice and to trace off an enlargement of the fluctuations either by mechanical or by photographic methods. In the second paper, Prof. Scripture describes a complete record of the melody of the Lord's Prayer as recited in the style characteristic of the eastern part of the United States. A diagram is given showing the main variations of pitch. An investigation in another branch of physiological acoustics, dealing with the audibility of vowel sounds under pathological conditions, is given by M. Marage in the *Comptes rendus* (February).

THE additions to the Zoological Society's Gardens during the past week include two White-crowned Mangabeys (*Cercocebus oethiops*) from West Africa, presented by Mr. C. R. Farquharson; an Ocelot (*Felis pardalis*) from Rio de Janeiro, presented by Mr. John Gordon; a Grand Eclectus (*Eclectus roratus*) from Moluccas, a Black-crested Cardinal (*Gubernatrix cristatella*) from Paraguay, a Red-headed Cardinal (*Paroaria larvata*), a White-throated Finch (*Spermophila lineola*) from Brazil, presented by the Right Hon. Earl of Crawford, K.T.; a Brown-throated Conure (*Conurus oeruginosus*) from South America presented by Mrs. M. Moir-Byres; a Barred Dove (*Geopelia striata*) from India, a West African Love-bird (*Agapornis pullaria*) from West Africa, presented by Sir Arthur Bigge, K.C.B.; a Common Snake (*Tropidonotus natrix*), British, presented by Mr. Oliver Roberts; a Yellow Baboon (*Papio cynocephalus*) from Africa, a Lesser White-nosed Monkey (*Cercopithecus petaurista*) from West Africa, a Lion Marmoset (*Midas rosalia*) from South-east Brazil, an Echidna (*Echidna hystrix*) from New South Wales, two Stanley Parrakeets (*Platycercus icterotis*), two Tree Sparrows (*Passer montanus*), three Limbless Lizards (*Pygopus lepidopus*), a Muricated Lizard (*Amphibolurus muricatus*), a Cunningham's Skink (*Egernia cunninghami*) from Australia, a Lesser White-fronted Goose (*Anser erythropus*), two Jackdaws (*Corvus monedula*, var.), European; an American Glass Snake (*Ophiosaurus ventralis*), a Hog-nosed Snake (*Heterodon platyrhinos*), two Couch's Snakes (*Tropidonotus ordinatus couchi*) from North America, deposited; nine Summer Ducks (*Aex sponsa*) from North America, purchased.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN SEPTEMBER:—

Sept. 3. 8h. Saturn in conjunction with moon. Saturn 5° 26′ S.
5. 9h. 26m. Minimum of Algol (β Persei).
7. 5h. Mercury at greatest eastern elongation (27° 0′).
11. 18h. Jupiter in opposition to the sun.
12. Saturn. Polar diameter = 16″·3, outer minor axis of outer ring = 14″·39.
15. Venus. Illuminated portion of disc = 0·002; of Mars = 0·891.
17. 9h. Venus in inferior conjunction with the sun.
,, 13h. 53m. to 14h. 36m. Moon occults α Cancri (mag. 4·3).
20. Sun totally eclipsed, invisible at Greenwich.
21. 7h. 13m. to 10h. 22m. Transit of Jupiter's Sat. III. (Ganymede).
23. 18h. Sun enters Libra. Autumn commences.
25. 11h. 9m. Minimum of Algol (β Persei).
27. 7h. 55m. to 11h. 2m. Transit of Jupiter's Sat. IV. (Callisto).
28. 7h. 58m. Minimum of Algol (β Persei).
,, 10h. 30m. to 13h. 40m. Transit of Jupiter's Sat. III. (Ganymede).
30. 13h. Saturn in conjunction with moon. Saturn 5° 32′ S.

NEW TABLE FOR EX-MERIDIAN OBSERVATIONS OF ALTITUDE.—In existing tables for obtaining the difference between the observed and meridian altitudes, when determining latitude by ex-meridian observations, one has to refer to *two* separate tables, using as arguments declination, hour angle and approximate latitude. To remedy this Mr. H. B. Goodwin, R.N., has just published a pamphlet (Griffin and Co., Portsmouth) showing how the problem may be solved by the use of *one* table only, which is included in his pamphlet, using approximate latitude and azimuth.

The principle on which the method is based is that a body near the meridian may be regarded as changing its altitude with a uniform rate of change, and at any one interval we may take the *mean* rate of change as representative, and obtain the "reduction" to meridian altitude from the formula $dz = \sin A \cos l . dh$, where dz is the change of altitude and dh the contemporaneous change of hour

angle; *dz* for each half degree of latitude and azimuth is given in the table. All that one has to do to obtain the "reduction" is to take the approximate azimuth from any azimuth tables—and this has to be done for another part of the problem—then take out the rate of change, *dz*, from the Goodwin table and multiply this by the number of minutes in the hour angle.

RETURN OF BROOKS'S COMET.—A telegram from Kiel announces that Brooks's comet was observed by Prof. Aitken at the Lick Observatory on August 18, and that the position of the comet at 12h. 17·4m. (Lick M.T.) on that date was R.A. = 21h. 2m. 51·3s., Dec. = −27° 4′ 19″. This position agrees closely with that given by an ephemeris computed by Herr P. Neugebauer, and published in No. 3868 of the *Astronomische Nachrichten*. The following is an extract from this ephemeris:—

Ephemeris 12*h.* (*M.T. Berlin.*)

1903	True α	True δ	log *r*	log Δ
	h. m. s.	° ′ ″		
Aug. 27	20 56 24·95	−27 0 30·4	0·3284	0·07060
,, 29	20 55 12·95	−26 57 6·4		
,, 31	20 54 6·78	−26 52 54·0	0·3259	0·07321
Sept. 2	20 53 6·98	−26 47 53·8		
,, 4	20 52 13·90	−26 42 6·8	0·3234	0·07693
,, 6	20 51 27·98	−26 35 33·6		
,, 8	20 50 49·45	−26 28 15·2	0·3210	0·08165
,, 10	20 50 18·61	−26 20 12·8		
,, 12	20 49 55·67	−26 11 27·7	0·3187	0·08727
,, 14	20 49 40·87	−26 2 1·0		
,, 16	20 49 34·32	−25 51 53·8	0·3164	0·09369
,, 18	20 49 36·19	−25 41 7·0		
,, 20	20 49 46·55	−25 29 41·9	0·3142	0·10081

According to Aitken's determination of the comet's position, as given above, this ephemeris needs a correction of +22·58s. in R.A. and +1′ 41″·2 in Dec.

Although not a bright object, this comet is of historical interest, because when it was first discovered by Brooks, in 1889, it was held to be a good illustration of the "capture theory" of comets, and was looked upon as identical with Lexell's lost comet of 1770, which had been "captured" by Jupiter. This belief was, however, discountenanced by the subsequent researches of Dr. Poor, of Baltimore. In 1889 Barnard observed the comet as double, and found that the two parts were slowly separating.

This comet has a period of 7·096 years, and was duly observed in 1896, when it performed its perihelion passage on November 4. For the present return the comet takes the designation 1903 *d*.

EPHEMERIS FOR COMET 1903 *c*.—An ephemeris for comet 1903 *c* is given in No. 3890 of the *Astronomische Nachrichten* by Herren M. Knapp and W. Dziewulski.

The comet is now too near the sun to be observed but it will be observable by astronomers residing in the southern hemisphere after the middle of September.

α CORONÆ A SPECTROSCOPIC BINARY.—Using the 80cm. refractor and the No. 1 spectrograph of the Potsdam Observatory, Prof. Hartmann has determined that the radial velocity of α Coronæ Borealis varies from −20km. (May 28, 1902) to +38km. (June 3, 1902). The observations extended over the period May, 1902–July, 1903, and the respective velocities were determined from measurements of the lines Hβ, Hγ, Hδ, λ 4481 (Mg) and λ 3934 (Ca). The period of the binary is given as about 17 days (*Astronomische Nachrichten*, No. 3890).

THE ALLEGHENY OBSERVATORY.—In his report for 1902 the director, Prof. F. L. O. Wadsworth, laments the fact that the new observatory buildings and their equipments are not yet completed, and especially urges the necessity for mounting and housing the new 30-inch refractor, the discs for which have already been received from Mantois, of Paris; for this purpose a fund of sixty-five thousand dollars is required, none of which is yet subscribed or provided for.

An excellent electrical equipment for lighting and heating, and for all kinds of experimental work, has been donated by Mr. Westinghouse.

An efficient time service was maintained throughout the year 1902 in spite of instrumental difficulties. General observational work has had to be suspended pending the removal to the new observatory. A large number of mathematical researches have already been carried out, and others are suggested for future attention, by the director.

The latter part of the report is devoted to an outline of the work it is proposed to do when the new observatory is in full swing; this work includes exhaustive daily observations of all the solar phenomena and seismographic, gravitational, and magnetic observations.

THE RELATIONS BETWEEN SCIENTIFIC RESEARCH AND CHEMICAL INDUSTRY.[1]

THE particular branch of science with which I have been asked to deal at this meeting of university extension students—viz. chemistry—is perhaps better calculated to illustrate the intimate connection between scientific research and *productive* industry than any other subject. I emphasise the term *productive* industry because it is desirable to distinguish between productiveness and trade, *i.e.* buying and selling. With the latter I have nothing to do beyond pointing out the very obvious principle that, without something to buy or sell, there would be no commerce, and consequently productive industry must be put into the first rank. Now chemical products of various kinds are absolutely indispensable to all civilised nations. You may remember that many years ago Lord Beaconsfield said that the state of trade could be gauged by the price of chemicals. A writer in the *North American Review* in 1899 published an article in which he laid it down that the nation which possessed the best chemists was bound to come to the forefront in the struggle for industrial supremacy. Of course, "there is nothing like leather," and I am bound to agree with him. Had he been an engineer or an electrician he might perhaps have said the same for mechanical or electrical engineering. At any rate, it is perfectly safe to generalise his statement, and to declare that the nation which possesses the most highly trained technologists is bound to take the lead.

In so many ways does chemistry come into contact with nearly every branch of industry that it is difficult to know where to draw the line in giving actual illustrations of the industrial results achieved through chemical research. It is not possible logically, for example, to distinguish between the results obtained through research directed towards the solution of a particular industrial problem and the results obtained as by-products in the course of purely scientific investigation. Industry has been advanced, and always will be advanced, by both methods. Bearing in mind also that chemistry, in its widest sense, is essentially the science of matter—at any rate until the physicist has electrified matter into his own domain—it is evident that we are concerned not only with the production of useful materials for direct consumption, but also with the production of materials required in other industries. Thus chemistry affects engineers through the metals, cements, and other materials used for constructive purposes, and through the fuels used as sources of energy; it affects the agriculturist on account of the relationship between the growing plant and the composition of the soil, as well as through the relationship between the composition of crops and their value as food-stuffs; it supplies materials for the pharmacist, for the manufacture of pottery, glass and soap, for the paper maker, for the dyer and colour-printer, for the bleacher, tanner, brewer and spirit distiller; it furnishes the explosives used in modern warfare, and it supplies photography with all the materials necessary for the practise of that art. Among later developments it may be claimed that the modern science of bacteriology is the outcome of chemical research, and the manufacture of anti-toxins—the industrial result of this science—has until quite recently been in the hands of the chemical manufacturers. I may remind you also that many important products such as sodium, aluminium, phosphorus, calcium carbide, caustic soda, and chlorine are manufactured by electrical processes, so that the demand for these products has given an impetus to the development of applied electricity.

[1] A Lecture delivered at the University Extension Meeting at Oxford on August 3, by Prof. Raphael Meldola F.R.S.